



**INVAC**  
CORPORATION

# PHOTOELECTRIC TAPE READER R-125

## FEATURES

- Photoelectric reading and unique incremental motor tape transport mechanism . . . requires no lubrication
- Asynchronous operation . . . up to 125 characters per second read speed
- Positive indexing
- Accommodates any 5-to-8 level code
- Solid state circuits completely contained with case
- Pulse operated and timed, no ac power requirements
- Rugged compact design . . . 6-3/4 in. lg, 6-1/2 in. deep, 6 in. high overall . . . weighs less than 5.3 pounds
- Uses all EIA approved tapes
- Built-in Zener diode voltage regulator for lamp supply

## APPLICATIONS

- Data entry for computer system, typewriters, communications, display consoles, tape buffers
- Merging and collating tapes
- Tape duplication
- Tape verification
- Process control
- Numerical machine control

## DESCRIPTION

The INVAC Model R-125 Tape Reader is a photoelectric unit capable of reading any 5, 6, 7, or 8-hole perforated tape at rates from 0 to 125 characters per second. Any tape with light transmission of 60 percent or less can be used. The tape reader consists of the following functional assemblies:

- Four-lamp light source.
- A bank of nine photodiodes, eight for data channels, and one for sprocket channel.
- Incremental motor tape transport mechanism.
- Tape transport driver printed circuit module.
- Driver output stage assembly.
- Nine-stage output amplifier printed circuit module.

The reader is equipped with a retractable hold-down clamp for easy, straight-in insertion of tape. In addition, adjustable guides are provided for accommodating 5, 6, 7, or 8-level tape (1/8 to 1.0 in. wide). Transport stepping, edge guiding and pitch requirements conform to EIA Standard RS-227.

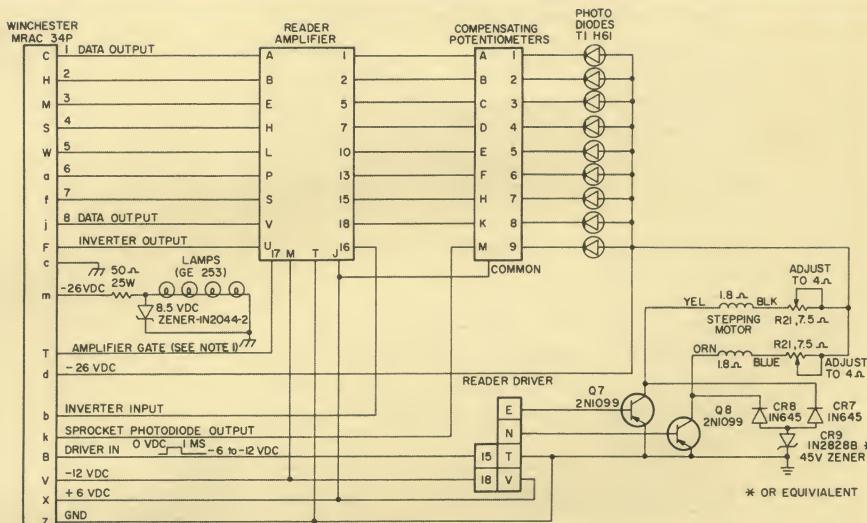


## OPERATION

Reader speed is from 0 to 125 characters per second on a start-stop basis. Tape transport functions are accomplished by a driver circuit and an incremental motor; read functions are performed photoelectrically using a four-lamp light source, a bank of nine photodiodes (eight for data and one for sprocket), and a data output amplifier circuit. When connected in the system one pulse per character is needed to operate the reader and transport the tape. An input is provided to gate the output amplifiers during tape transport.

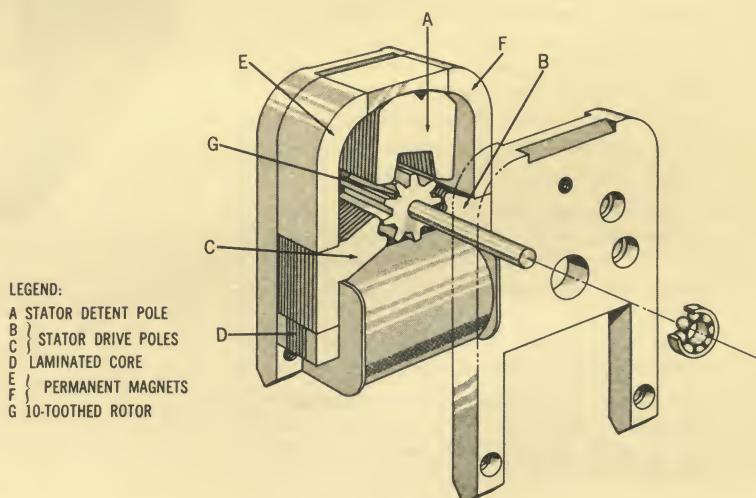
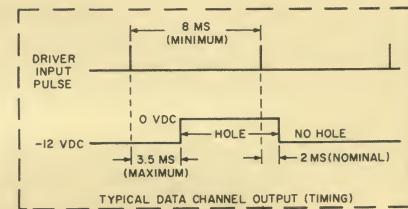
The reader driver circuit and incremental motor\* comprise the tape transport system for the Model R-125 Tape Reader. The reader driver circuit consists of a flip-flop, the outputs of which are differentiated and applied to the incremental motor via two power transistors. The incremental motor is a single-phase, high-torque synchronous motor which uses only the magnetic forces developed between the rotor and stator to step the shaft. Power transistors Q7 and Q8 cause the motor shaft to step at a fixed or variable stepping rate up to 125 characters per second. Resistors R21 and R22 provide additional resistance for the 1.8 ohm motor windings.

The reader amplifier consists of nine identical stages mounted on a single card. Each stage contains an emitter follower and an inverter circuit. Eight of the stages are for data channels. Both input and output of the ninth stage are wired to the external connector so that it may be optionally used to amplify the sprocket output, or as an amplifier to gate the data channel outputs from an external signal. Variable resistors mounted on a separate circuit board are used to balance the photodiode input to the reader.



### NOTES:

1. AMPLIFIER GATE (PIN T) MUST BE AT  $-0.2 \text{ VDC} \pm 0.2 \text{ VDC}$  TO ENABLE READER AMPLIFIER OUTPUTS. IF NO GATING IS DONE AT THIS POINT PIN T SHOULD BE TIED TO GROUND. RECOMMENDED OPERATION IS TO INHIBIT THE AMPLIFIERS BY HOLDING PIN T AT LOGICAL ZERO ( $-9 \text{ VDC} \pm 3 \text{ VDC}$ ) FOR 4 MILLISECONDS FOLLOWING THE LEADING EDGE OF THE DRIVER INPUT PULSE.
2. THE SPROCKET PHOTODIODE OUTPUT CAN BE AMPLIFIED THROUGH THE SPARE INVERTER BY CONNECTING PIN K TO PIN B. GATING OF OUTPUT DATA BY THE SPROCKET OUTPUT CAN THEN BE ACCOMPLISHED BY CONNECTING THE INVERTER OUTPUT, PIN F, TO THE AMPLIFIER GATE, PIN T.





## SPECIFICATIONS

## PHOTOELECTRIC TAPE READER R-125

Standards	reads all E1A approved tapes and most out of tolerance tapes
Tape Types	accommodates any tape with light transmission of 60 percent or less (yellow spray-oiled tape has 60 percent light transmission)
Tape Width	adjustable guides for 5, 6, 7, or 8-level tape ( $\frac{1}{16}$ to 1.0 in.)
Tape Thickness	0.0045 inch nominal. For other thicknesses consult factory.
Number of Channels	Eight plus sprocket hole (accommodates 5 through 8-level tape).
Speed	0 to 125 characters per second stepping rate
Start Characteristics	A positive pulse of $-9$ vdc $\pm 3$ vdc rising to $-0.2$ vdc $\pm 0.2$ vdc is required for each step. Pulse duration of 30 us to 4 ms can be used.
Stop Characteristics	Approximately 3.5 ms after leading edge of start pulse.
Reader Amplifier Output	Logical ONE (0 vdc). Output transistor is capable of driving 7 ma load to saturation (0 to 0.4 volt)—Maximum load voltage $-12$ vdc. Logical ZERO ( $-12$ vdc). 1.8 k ohms returned to $-12$ vdc.
Input Power Requirements	$+6$ vdc, $\pm 2\%$ at 100 ma average (driver and amplifier bias voltage); $-12$ vdc, $\pm 2\%$ at 500 ma average (driver and amplifier); $-26$ vdc, $\pm 5\%$ at 5.0 ampere average peak (diodes, lamps, motor supply voltage).
Temperature	
Operating	32F to 130F
Non operating	-40 to 160F
Connector	Winchester Type MRAC, 34 pin male connector (See wiring diagram for connections). Mating connector not supplied.
Weight	5.3 pounds
Color	Two tone gray, colors 26492 and 26132, Federal Standard 595.

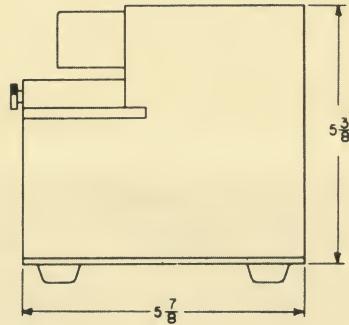
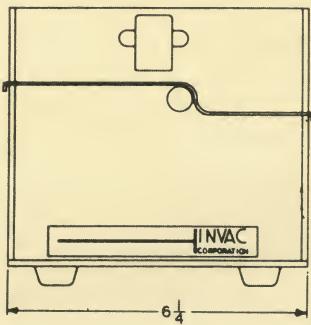
### PRINTED CIRCUIT SPECIFICATIONS

Base Material	Glass base epoxy, NEMA grade G10, two ounce copper clad both sides.
Plating	All holes are through plated. Entire etched pattern is solder plated 0.002 in. thick; printed contacts are rhodium plated at least 0.00025 in. thick.

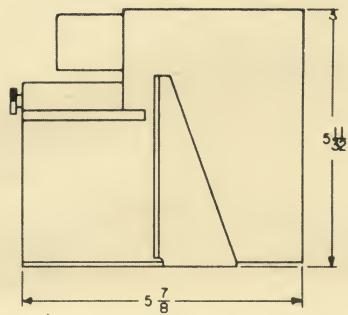
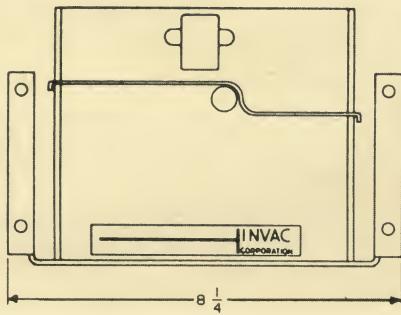
**PACKAGE STYLES** The Model R-125 Photoelectric Tape Reader is available in two packaging styles . . . self contained in a case with rubber feet for desk or bench mounting or attached to an adapter plate for panel mounting (See diagram).

**PACKAGE STYLES:**

1. DESK TOP UNIT

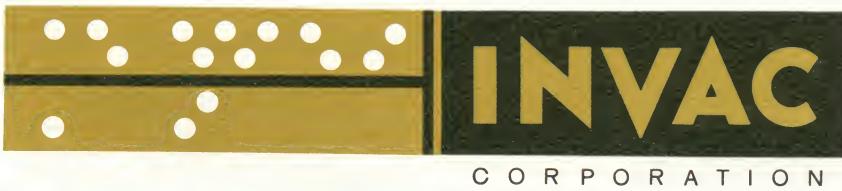


2. WITH ADAPTER PART NO. 80-3-143  
FOR PANEL MOUNTING



**INVAC** CORPORATION

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# PHOTOELECTRIC TAPE READER R-110

## FEATURES

- Photoelectric reading and unique tape transport mechanism
- Asynchronous operation
- Positive indexing
- Accommodates any 5- to 8-level code
- Solid state circuits completely contained with case
- Pulse operated and timed, no ac power requirements
- Rugged compact... 6-3/4 in. lg, 4-1/2 in. deep, 6 in. high overall... weighs less than 4.3 pounds
- Uses all EIA approved tapes
- Built-in Zener diode voltage regulator for lamp supply

## APPLICATIONS

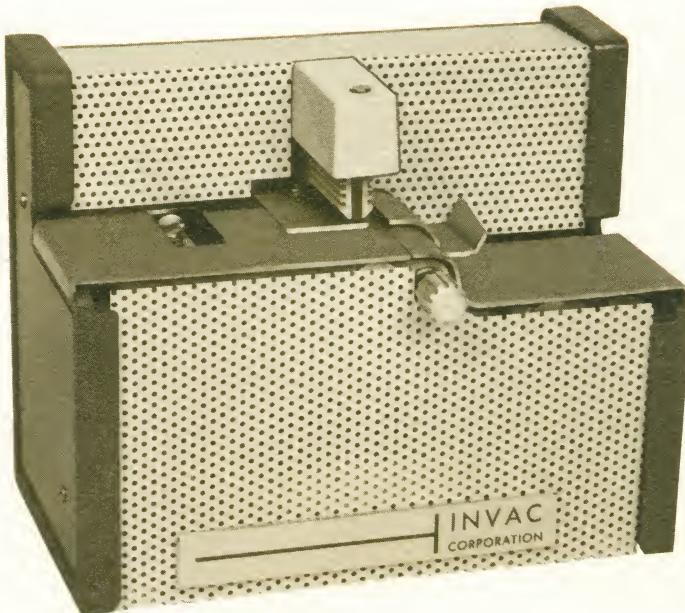
- Data entry for computer system, typewriters, communications, display consoles, tape buffers
- Merging and collating tapes
- Tape duplication
- Tape verification
- Process control
- Numerical machine control

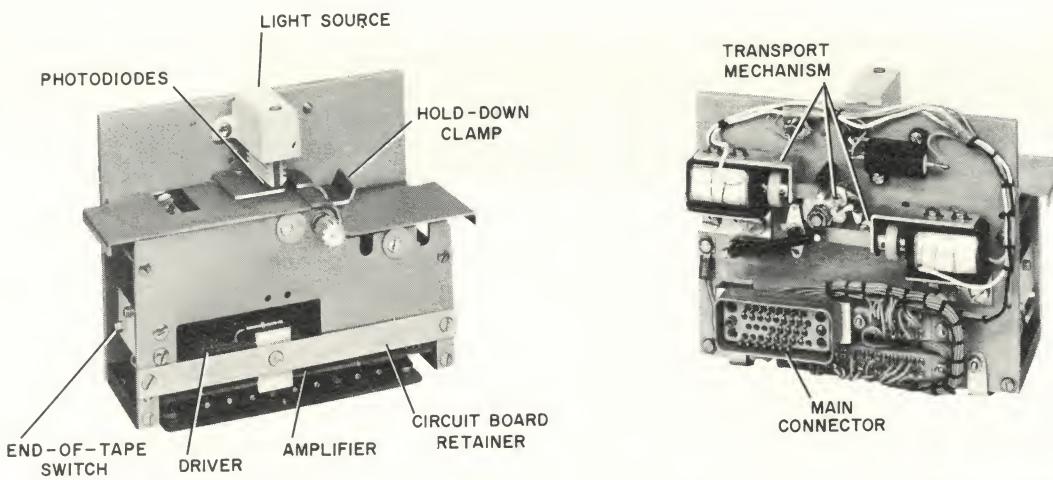
## DESCRIPTION

The INVAC Model R-110 Tape Reader is a photoelectric unit capable of reading any 5, 6, 7, or 8-hole perforated tape at rates from 0 to 35 characters per second. Any tape with light transmission of 60 percent or less can be used. The tape reader consists of the following functional assemblies:

- a. Four-lamp light source
- b. A bank of nine photodiodes, eight for data channels, and one for sprocket channel.
- c. Solenoid-actuated tape transport mechanism.
- d. Tape transport driver printed circuit module.
- e. Nine-stage output amplifier printed circuit module.

The reader is equipped with a retractable hold-down clamp for easy, straight-in insertion of tape. In addition, adjustable guides are provided for accommodating 5, 6, 7, or 8-level tape (1/8 to 1.0 in. wide.) Transport stepping, edge guiding and pitch requirements conform to EIA Standards RS-227.

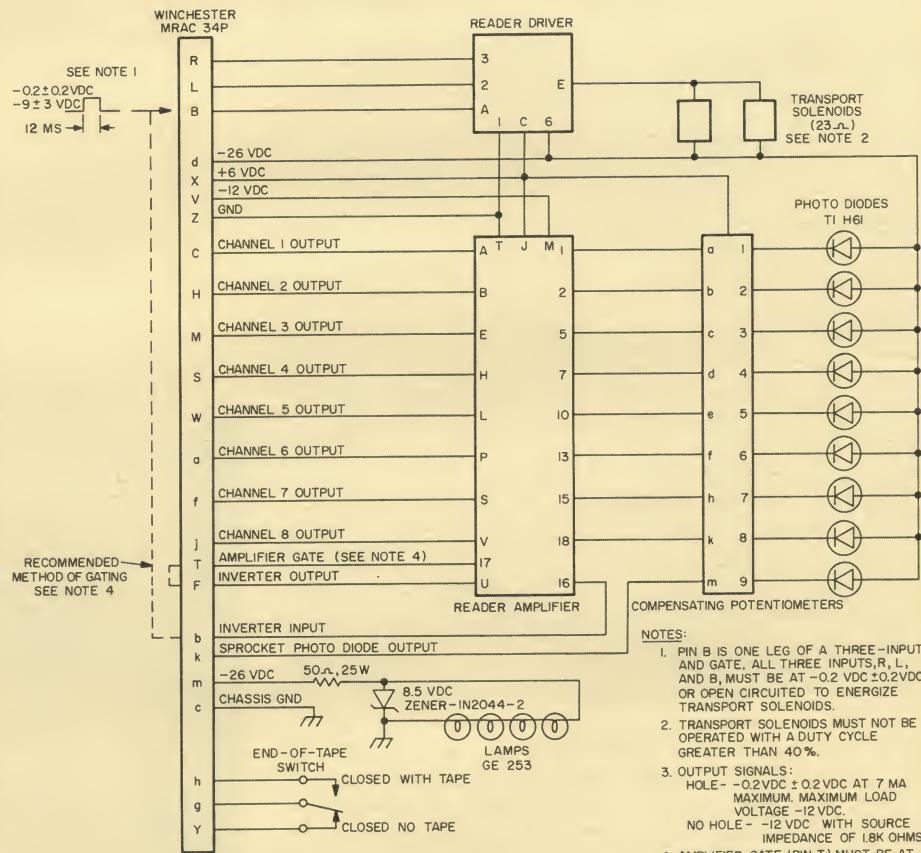




## OPERATION

Reader speed is from 0 to 35 characters per second on a start-stop basis. Tape transport functions are accomplished by a driver circuit and two solenoids; read functions are performed photoelectrically using a four-lamp light source, a bank of nine photodiodes (eight for data and one for sprocket), and a data output amplifier circuit. When connected in the system one pulse per character is needed to operate the reader and transport the tape. An input is provided to inhibit the output amplifiers during tape transport. The sprocket hole output may be used for this purpose; however, use of the transport command is recommended. The reader driver circuit consists of a three-input AND gate stage, an emitter follower stage, and an inverter driver stage. The driver input pins (R, L and B) must be in the logical ONE state ( $-0.2 \text{ vdc} \pm 0.2 \text{ vdc}$ ) or open circuited to energize the transport solenoids. When in the logical ONE state the reader driver circuit applies  $-26 \text{ vdc}$  at two amperes to energize the 23-ohm solenoid coils to transport the tape.

The reader amplifier consists of nine identical stages mounted on a single card. Each stage contains an emitter follower and an inverter circuit. Eight of the stages are for data, the ninth is for sprocket. A variable resistor balances the photodiode input signal to the reader amplifier.



## PACKAGE STYLES

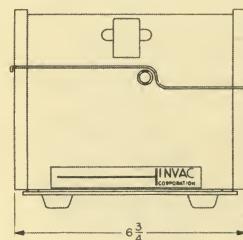
The Model R-110 Photoelectric Tape Reader is available in two packaging styles . . . self contained in a case with rubber feet for desk or bench mounting, or attached to an adapter plate for panel mounting. In addition, the reader can be mounted and used with an inside-out tape supply and tape takeup reel, designated as Model THR-100 Tape Handler-Reader.

## OPTIONAL EQUIPMENT

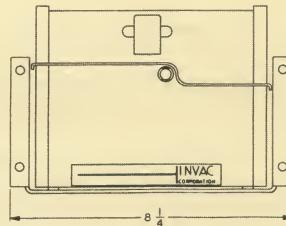
Tape Handler-Reader, Model THR-100 consists of a Model R-110 Tape Reader, an eight-inch diameter supply reel, and an eight-inch diameter takeup reel mounted on a 19 inch by 15- $\frac{3}{4}$  inch panel. The Model THR-100 accommodates 5 through 8-level tape. The tape supply reel has a capacity of 1000 feet; tape takeup reel has a handling capacity of 1000 feet. A tight tape switch is included with each Model THR-100.

### PACKAGE STYLES:

#### 1. DESK TOP UNIT

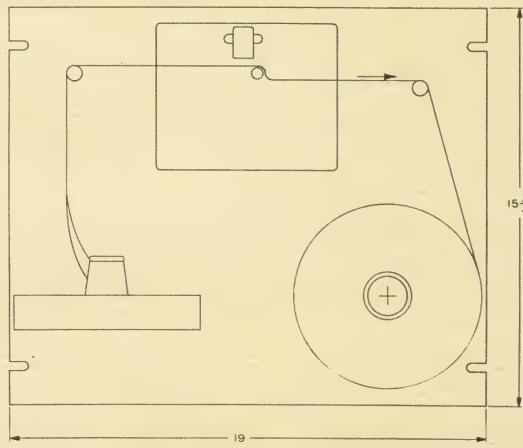


#### 2. WITH ADAPTER PART NO. 80-3-143 FOR PANEL MOUNTING



### ACCESSORY EQUIPMENT:

#### 1. TAPE HANDLER-READER MODEL NO. THR-100



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**INVAC**  
C O R P O R A T I O N

**TAPE PUNCH**  
**P-135**

## FEATURES

- Interface connection simplified . . . completely asynchronous operation
- Can be battery operated . . . no ac power requirements
- Long life — low maintenance . . . solenoid operated, no motor, no clutch
- Pulse operated and timed
- Rugged compact design . . . 7-3/4 in. lg, 6-1/4 in. deep, 6-3/4 in. high overall . . . weighs less than 9-1/2 pounds
- Tape can be manually positioned forward or backward
- Side loading of tape . . . positive indexing insures accurate pitch
- Punches any 5- to 8-level code

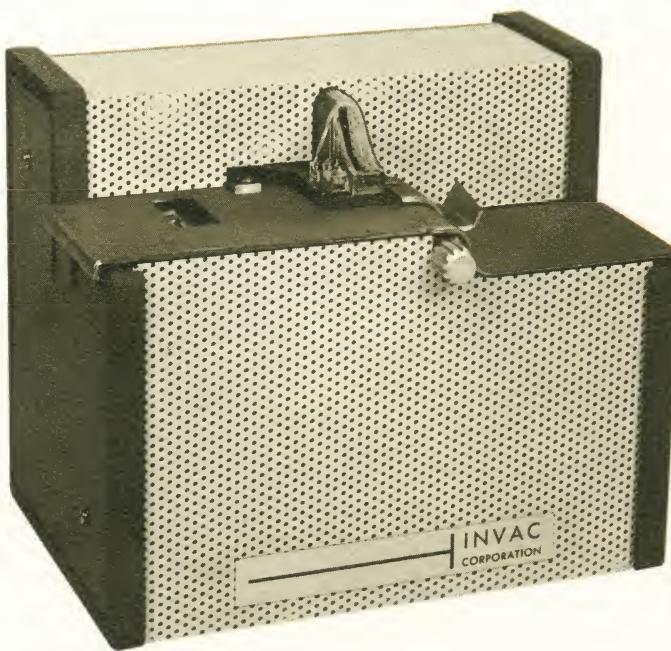
## APPLICATIONS

- Low speed — low cost digital recording . . . Data communications, Computer output, Analog to Digital converter output, Data reduction, Automatic testing and check-out recording.
- Portable operation . . . can be used in remote locations with battery power.

## DESCRIPTION

The INVAC Model P-135 Tape Punch is a solenoid-actuated tape perforator capable of punching 5, 6, 7, or 8 channel tape at rates from 0 to 35 characters per second. The basic tape punch consists of eight data solenoids, one sprocket hole solenoid, two solenoids each for bail and transport functions, and an end-of-tape switch.

The punch is equipped with a retractable hold-down clamp for easy, straight-in insertion of tape. In addition the punch has adjustable guides for accommodating 5, 6, 7 or 8 level tape (1/16 to 1 in. wide). Oiled and non-oiled paper, mylar, aluminized mylar and vulcanized fiber tapes can be used. Transport mechanism stepping is preset at the factory to  $\pm 0.009$  inches within spans of 0.9 to 6 inches. Edge guiding is preset to  $0.392 \pm 0.003$  inches from the feed hole. Pitch requirements conform to EIA Standard RS-227.



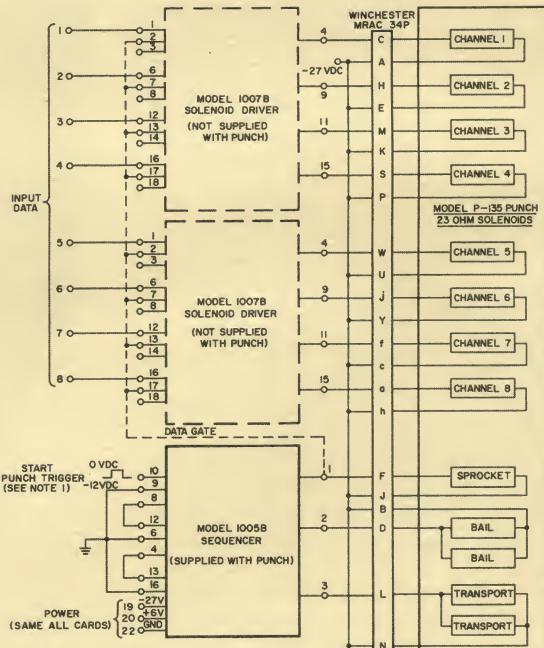
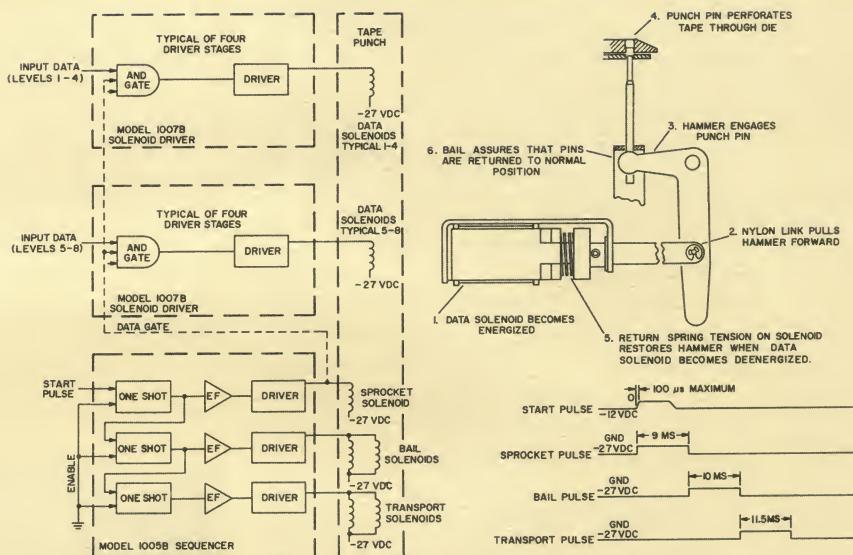
## OPERATION

The Model 1005B Sequencer printed circuit module is supplied with each tape punch (See Block Diagram). This circuit consists of three separate stages, each containing an AND gate, a one-shot multivibrator, and a driver circuit. A series of three pulses (from the Sequencer) are used to control the operation of the sprocket, bail and transport functions of the punch. The first stage output pulse energizes the sprocket solenoid in the punch, the second energizes the bail solenoids, and the third energizes the transport solenoids.

The recommended input signal to the first stage one-shot multivibrator of the Sequencer (pin 10) is a positive-going trigger pulse of  $-9 \pm 3$  volts amplitude and a maximum rise time of 100 microseconds. As shown in the diagram the output from the first stage one-shot multivibrator is used to trigger the second stage multivibrator and the output of the second stage multivibrator triggers the third stage multivibrator. The resulting output from the three stages of the Sequencer is a series of current pulses occurring sequentially in time. Each pulse is capable of driving a 2.0 ampere load to  $-30$  volts for energizing the solenoids; each pulse is adjustable from 8 to 13 milliseconds in duration.

The sprocket pulse output from the first stage of the Sequencer can be applied to the Model 1007B Solenoid Driver (not supplied) and combined with the channel input data to energize the data solenoids and activate the punch pins.

The Model 1007B Solenoid Driver is a solid-state printed circuit module designed for use as an accessory with the tape punch. The Solenoid Driver consists of four separate stages, each containing a three-input AND gate, an emitter follower, and a driver circuit. For five through eight-level punch operation, two Model 1007B Solenoid Driver modules are required. Pins 1, 6, 12, and 16 are channel input data pins; pins 2, 7, 13 and 17 can be used for the sprocket pulse input (from Sequencer) and combined with the channel input data to energize the punch solenoids and perforate the tape.



NOTES:  
 1. START PUNCH TRIGGER PULSE OF  $-9VDC \pm 3VDC$  OR LEVEL CHANGE AT PIN 10, RISE TIME 0.1 MS OR BETTER IS REQUIRED.  
 2. DRIVER CAN OUTPUT-EACH CIRCUIT 1.3 AMP TO  $-25VDC$  TO  $-29VDC$ .  
 3. WHEN ALL INPUTS GO TO LOGICAL ONE DRIVER GOES TO  $-0.8VDC \pm 0.4VDC$  WHEN LOADED.  
 4. LOGIC LEVELS:  
 ONE ( $-0.2VDC \pm 0.2VDC$ ), ZERO ( $-9VDC \pm 3VDC$ )

**SPECIFICATIONS****TAPE PUNCH P-135**

Standards	exceed EIA requirements		
Tape Types	oiled and non-oiled paper, mylar, aluminized mylar, vulcanized fiber tape		
Tape Width	adjustable guides for 5, 6, 7 or 8 — level tape (1/8 to 1.0 inch)		
Tape Thickness	0.0045 inch nominal. For other thicknesses consult factory		
Number of Channels	Eight plus sprocket hole (accommodates 5 through 8 — level tape)		
Speed	0 to 35 characters per second, asynchronous		
Input	parallel by bit, serial by character		
Power Requirements at 27 volts dc	CPS	Average Words*	Code Delete
	35	2.0 ampere ave	2.8 ampere ave
	20	1.2 ampere ave	1.6 ampere ave
	5	0.3 ampere ave	0.4 ampere ave
	0	0.	0.
	* See Model 1005B Sequencer Power Requirements for Sequencer biasing and transistor currents.		
Temperature	32F to 130F		
Operation	-40 to 160F		
Non-operating	smaller than most punch heads, see Packaging Styles diagram		
Size	Winchester Type MRAC 34P (See wiring diagram for connections).		
Output Connector	9-1/2 pounds		
Weight	Two-tone gray, colors 26492 and 26132, Federal Standard 595.		
Color	Form C, Micro Type VA-14, 5 ampere 250 vac switch is supplied.		
End-of-Tape Switch			

**MODEL 1005B SEQUENCER SPECIFICATIONS**

Power Requirements	—25 to —29 volts dc, 180 milliamperes average +6 volts dc, 70 milliamperes
Pulse Input	positive-going trigger pulse, amplitude 12 volts, maximum rise time 100 microseconds.
Pulse Output	Three output pulses occurring sequentially in time, each pulse adjustable from 8 to 13 milliseconds, each pulse capable of driving a 2.5 ampere load to —30 volts
Operating Temperature	32F to 130F
Physical Dimensions	4-1/2 inches by 5-3/8 inches by 3/4 inches.
Connector Type	Winchester PB-44. (22 pin mating connector is supplied with punch)

**PRINTED CIRCUIT SPECIFICATIONS**

Base Material	Glass base epoxy, NEMA grade G10, two ounce copper clad both sides.
Plating	All holes are plated through. Entire etched pattern is solder plated 0.002 in. thick; printed contacts are plated rhodium at least 0.00025 in. thick.

## PACKAGE STYLES

The Model P-135 Tape Punch is available in two packaging styles . . . self contained in a case with rubber feet for desk or bench mounting, or attached to an adapter plate for panel mounting. In addition, the punch can be panel mounted and used with tape supply and tape take-up reels (Tape Handler-Punch, Model THP-100).

## OPTIONAL EQUIPMENT

Transistorized Solenoid Driver Cards, Model No. 1007B, four driver stages per card. Two cards required for five through eight-level operation.

**Power Requirements** —25 volts to —29 volts dc, 60 milliamperes average; +6 volts dc, 11 milliamperes (per driver stage)

**Input Logic Level** logical ONE,  $-0.2 \pm 0.2$  volts dc; logical ZERO  $-9 \pm 3$  volts dc. Input stage is a three-input AND gate. For details see wiring diagram.

**Output Characteristics** pulse duration 100 milliseconds maximum; maximum load 1 ampere to —30 volts dc.

**Operating Temperature** 32F to 130F

**Physical Dimensions** 4-1/2 inches by 5-3/8 inches by 3/4 inches (per card)

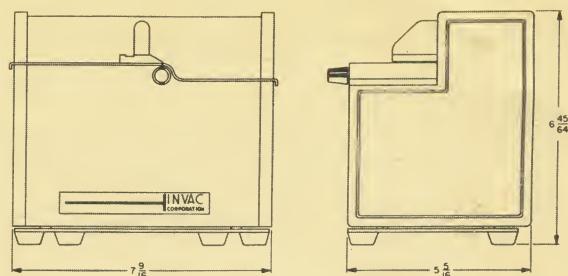
**Connector Type** Winchester PB-44. (22 pin mating connector is supplied)

**Tape Handler, Punch, Model THP-100.** Consists of 15-3/4 in. by 19 in. panel containing motorized take-up reel, supply reel, chad drawer, and tape tensioning arms for 0 to 35 cps operation.

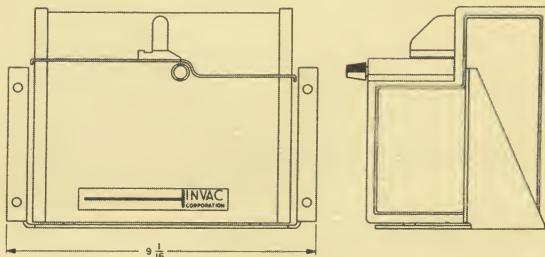
**Tight Tape Switch, Model SWT-100.**

### PACKAGE STYLES:

#### I. DESK TOP UNIT

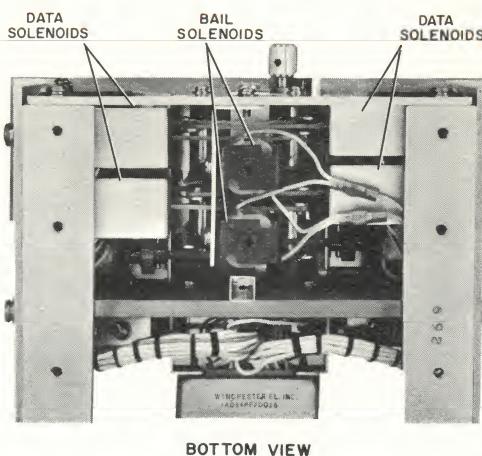
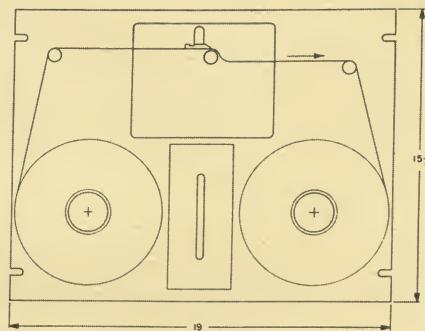


#### 2. WITH ADAPTER PART NO. 80-3-112 FOR PANEL MOUNTING

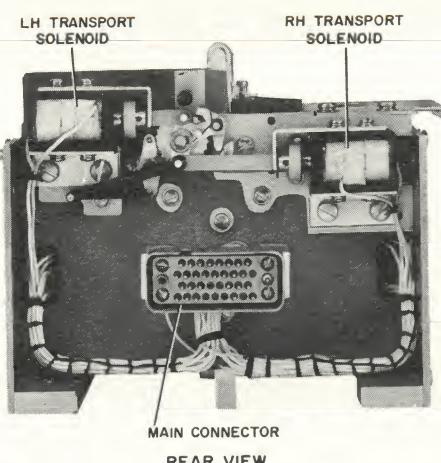


### ACCESSORIES:

#### I. TAPE HANDLER-PUNCH, MODEL NO. THP-100



BOTTOM VIEW



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